

SCIENCE UPDATE

NAMRL MISSION: TO CONDUCT RESEARCH, DEVELOPMENT, TESTING, AND EVALUATION IN AEROSPACE MEDICINE AND RELATED SCIENCES TO ENHANCE THE HEALTH, SAFETY AND OPERATIONAL READINESS OF NAVY, MARINE CORPS, AND OTHER MILITARY PERSONNEL.

NAMRL PRESENTS AT ASMA CONFERENCE

SUMMER 2009

The annual meeting of the Aerospace Medical Association (AsMA) provides a multifaceted forum for all aerospace medicine disciplines, and brings together a diverse group of civilian and military personnel from the United States and abroad. During the 80th meeting in Los Angeles, CA, three researchers from NAMRL presented posters and papers. There was a discussion of the efficacy of armodafinil as a fatigue countermeasure during military air traffic control (ATC) operations. Results from this work demonstrated that armodafinil significantly improved attention, and also suggests that armodafinil should not only be used with military ATCs, but also continue to be studied in

other high tempo military operations. In addition, research involving Survival, Evasion, Resistance, and Escape (SERE) training was presented. The presentation underlined the unique physiological and psychological predictors for stress and relationships to performance during SERE training, and also included a discussion of possible interventions. This work, combined with previous data, will surely enhance the military's understanding of the key predictors of stress reactivity during extreme military training, and perhaps aid in treatment. Finally, a NAMRL researcher presented a poster and interactive computer simulation concerning enhanced spatial disorientation

(SD) training. The training modules contain current empirical knowledge and use multi-media learning to convey the latest developments in aeromedical scientific research. This updated training met a critical need by providing instructors with the latest SD information. NAMRL's mission ties directly to AsMA's initiative of promoting and enhancing the health, safety and performance of those involved in the aerospace field. These presentations were excellent examples of the lab's ongoing commitment to exploring and finding practical solutions to military operational problems.



INSIDE THIS ISSUE:

OPERATIONAL STRESS AND RESILIENCE PROGRAM	2
TRANSFER OF SIMULATION-BASED TRAINING	2
CDR'S CORNER	3

NAMRL RESEARCHER EDUCATES JOINT SERVICE MEDICAL PROVIDERS



The Department of the Army Combat Operational Stress Control Course provides deploying Army, Navy, and Air Force medical and support personnel with current combat stress theories, research, and techniques, along with joint infrastructure, in preparation for deployment to Iraq or Afghanistan. Participants selected for training are

slated to deploy to Iraq or Afghanistan in various combat stress support roles within the next three months. NAMRL's Director of Aeromedical Research, was invited to present briefs on combat stress performance techniques, the Navy Bureau of Medicine's Combat Operational Stress Control (COSC) programs, and discuss

promising NAMRL research projects related to stress, resilience, and operational performance. NAMRL was the sole Navy representative agency joining predominately Army, Air Force, and Marine Corps combat stress program agencies whose representatives discussed emerging combat stress topics, research initiatives, and resilience preparation strategies.

OPERATIONAL STRESS AND RESILIENCE PROGRAM

Funded by the Office of Naval Research and Defense Advanced Research Projects Agency, the Operational Stress and Resilience Program (OSRP) uses state-of-the-art technologies to measure psychophysiological responses to stressful events under both laboratory and operational conditions.

NAMRL is home to OSRP's Psychophysiology Laboratory. Measurement capabilities include: heart rate, stroke volume, cardiac output, endocrine sampling, pupillometry, eye tracking, electrogastragraphy (EGG), electrocardiography (EKG), biometrics, and blood pressure.

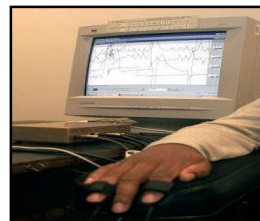
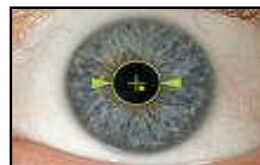
Our team of military and civilian researchers utilizes these capabilities to further the scien-

tific knowledge of operational stress. Driven by the needs of the operational community, we continually explore additional research thrusts and collaborative opportunities.

NAMRL also has unsurpassed access to fleet personnel in Navy and Marine Corps units, as well as collaborations with nationally ranked universities and research institutes. Because of this, OSRP has become a comprehensive network of efforts with one goal: *helping the war-fighter*. Current efforts focus on both laboratory and real-world military settings. Using our suite of physiological and psychological metrics, a multi-modal approach to predicting stress and performance is achieved. Our research team is currently initiating a

study titled "Psychophysiology of Deception: A cross-cultural comparison". This study focuses on physiological markers of deceptive behavior. Data collection will begin in the fall. Also, research involving Survival, Evasion, Resistance, and Escape training (SERE) is ongoing. Data analysis and interpretation for SERE I and II continue while SERE III data collection begins this July. Proposals to conduct SERE IV are in progress.

Current collaborations include: Naval Health Research Center, Duke University Medical Center, California State University, University of California San Diego, Yale University School of Medicine and Harvard University.



USING EXPERT RATINGS TO MODEL TRAINING TRANSFER FROM SIMULATION-BASED TRAINERS

The key to an effective training system is its ability to aid personnel in appropriate skill development and knowledge. Training effectiveness evaluation (TEE) is the measure of this skill transfer and is most often performed via training transfer studies, in which student performance is assessed before, during and after exposure to the trainer. However, studies are often time-consuming and expensive; and as a result, they are not performed. One current NAMRL project is investigating faster, less expensive means to perform TEE, utilizing subject matter expert (SME) ratings to model training transfer.

Sponsored by the Office of Naval Research (Code 30), under

the Human Performance, Training and Education (HPT&E) program, this project is evaluating three Marine Corps training systems used to train Fire Support Teams (FiST). FiST teams coordinate fires — air, mortar, artillery and sometimes naval gunnery— to support Marine infantry maneuver elements.

In 2008 the NAMRL team of researchers performed a detailed task analysis of the FiST mission. In 2009 they are applying the results of the task analysis to determine what an "ideal" FiST trainer would look like, in terms of the tasks it should focus on most. Marine FiST instructors are assisting the effort by providing ratings on these critical tasks for two different simulation-

based trainers, and for live fire training. The ratings received by each training system will be compared against actual student performance in each trainer over time. The results will determine if expert ratings of the trainers are predictive of actual training system efficacy. If successful, the process will be applied to a different training domain—motor convoy operations - during 2010, to assess the generalizability of the modeling approach. Ultimately, the goal of the research is to provide training developers and practitioners a time-and-cost-effective means with which to perform training effectiveness evaluation in instances when a full-scale training transfer study cannot be performed.



COMMANDER'S CORNER



For my first Commander's Corner it seems appropriate to highlight the impressive productivity that our team of researchers has recently achieved and to provide an update on our approaching BRAC transition to Wright Patterson Air Force Base. NAMRL has embraced Lean Six Sigma (LSS) principles to accomplish significant improvements in business methodology with the goal of decreasing the time from bench to battlefield without compromising quality. Our researchers have put this new philosophy into practice and are delivering more products per \$100K of funding, and more overall products, compared to any recent period in NAMRL's history. Productivity has become an integral part of the research process at NAMRL, with productivity being defined as published articles and technical reports, delivered technology, research-based formal recommendations on standards or policy, and other pre-identified deliverables. Figure 1 shows the results of a recent assessment of the return on investment for NAMRL research from FY05-FY09 (projected). While FY05 had more than double the funding compared to FY08 and FY09, only 1 product was delivered that year. In contrast, 18 products were delivered in FY08, and for FY09, 19 products have already been delivered through the first half of the year (Mar 09). Additionally, when products per \$100K of investments were considered, FY05 was a mere 0.07, with FY08 at 0.66 and FY09 projected to be 0.87. These facts speak to the professionalism and dedication of NAMRL researchers to deliver what has been promised to the sponsor with the goal of supplying well researched answers and products to our fleet customer.

During a time of general economic downturn, NAMRL has been thriving by executing the LSS concept of a workforce restructure, aimed at trimming overhead administrative costs and investing in team members with a more direct impact on production and income generation. We have more than doubled our Ph.D. researcher staff in the past year (4 vs. 10 current), along with the addition of key research support personnel. To expand our capabilities even further, NAMRL has taken advantage of teaming with several collaborators from Navy, other government organizations, and private and academic institutions to enhance capabilities and quality, and ensure the optimal utilization of resources and skills. The overall results of the minimal, yet critical, increase in overall staff size and proper utilization of interdisciplinary teamwork are streamlined workflow, enhanced productivity, and greater mission focus.

As we move forward, and envision our research endeavors at Wright Patterson AFB, it becomes abundantly clear that we must continue this mission of productive, quality, and collaborative research based on empirical evidence of success. The laboratory move will not begin until FY11, but NAMRL has already begun the work of laying scientific bridges to ensure a smooth and highly productive transition. The NAMRL team is determined to remain fully operational during the move and we are confident this can be accomplished through cooperation with our research allies in the Pensacola and Dayton areas. Another key to success is the decision to move our research focus away from large device-based research to "portable" research projects or ones that can be accomplished at field laboratories and partner facilities to capitalize on external collaborations and resources. This will allow our researchers to continue their funded projects through the transition, meeting milestones and delivering products. We look forward to our partnership with the Air Force as we create the new Aeromedical Center of Excellence and solidify our laboratories' role as the leaders in aviation research for the Navy, Marine Corps, and Department of Defense at WPAFB.



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Figure 1.

